Appendice A – Le formule dei modelli di decomposizione

1) Modello di scomposizione della variazione delle nascite Down

Riportiamo di seguito l'espressione delle diverse variazioni congiunte dei fattori considerati.

$$I(p,\beta)=\frac{\sum_{15}^{49} {}_1P\,{}_2p_i\,{}_1TFT\,{}_2\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49} {}_1P\,{}_1p_i\,{}_1TFT\,{}_1\beta_i k_i\,{}_1\alpha_i}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2p_i}{{}_1p_i}\,\frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i} \tag{A.1}$$

$$I(\alpha,\beta)=\frac{\sum_{15}^{49} {}_1P\,{}_1p_i\,{}_1TFT\,{}_2\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49} {}_1P\,{}_1p_i\,{}_1TFT\,{}_1\beta_i k_i\,{}_1\alpha_i}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\alpha_i}{{}_1\alpha_i}\,\frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i} \tag{A.2}$$

$$I(\alpha,p)=\frac{\sum_{15}^{49} {}_1P\,{}_2p_i\,{}_1TFT\,{}_1\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49} {}_1P\,{}_1p_i\,{}_1TFT\,{}_1\beta_i k_i\,{}_1\alpha_i}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\alpha_i}{{}_1\alpha_i}\,\frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i} \tag{A.3}$$

$$I(\alpha,\beta,p)=\frac{\sum_{15}^{49} {}_1P\,{}_2p_i\,{}_1TFT\,{}_2\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49} {}_1P\,{}_1p_i\,{}_1TFT\,{}_1\beta_i k_i\,{}_1\alpha_i}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\alpha_i}{{}_1\alpha_i}\,\frac{{}_2\beta_i}{{}_1\beta_i}\,\frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i} \tag{A.4}$$

L'espressione delle variazioni condizionate sono riportate di seguito.

$$I(p/\beta)=\frac{I(p,\beta)}{I(\beta)}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2p_i}{{}_1p_i}\,\frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\beta_i}{{}_1\beta_i}} \tag{A.5}$$

$$I(\alpha/\beta)=\frac{I(\alpha,\beta)}{I(\beta)}=\frac{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\alpha_i}{{}_1\alpha_i}\,\frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i\,\frac{{}_2\beta_i}{{}_1\beta_i}} \tag{A.6}$$

$$I(\alpha / p) = \frac{I(\alpha, p)}{I(p)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2p_i}{{}_1p_i}} \qquad (A.7)$$

$$I(\beta / p) = \frac{I(p, \beta)}{I(p)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2p_i}{{}_1p_i} \frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2p_i}{{}_1p_i}} \qquad (A.8)$$

$$I(\beta / \alpha) = \frac{I(\alpha, \beta)}{I(\alpha)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2\beta_i}{{}_1\beta_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i}} \qquad (A.9)$$

$$I(p / \alpha) = \frac{I(\alpha, p)}{I(\alpha)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i}} \qquad (A.10)$$

$$I(\alpha / \beta, p) = \frac{I(\alpha, \beta, p)}{I(\beta, p)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2\beta_i}{{}_1\beta_i} \frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2\beta_i}{{}_1\beta_i} \frac{{}_2p_i}{{}_1p_i}} \qquad (A.11)$$

$$I(\beta / \alpha, p) = \frac{I(\alpha, \beta, p)}{I(\alpha, p)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2\beta_i}{{}_1\beta_i} \frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2p_i}{{}_1p_i}} \qquad (A.12)$$

$$I(p / \alpha, \beta) = \frac{I(\alpha, \beta, p)}{I(\alpha, \beta)} = \frac{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2\beta_i}{{}_1\beta_i} \frac{{}_2p_i}{{}_1p_i}}{\sum_{15}^{49} {}_1D_i \frac{{}_2\alpha_i}{{}_1\alpha_i} \frac{{}_2\beta_i}{{}_1\beta_i}} \qquad (A.13)$$

Vediamo, infine l’espressione delle diverse interazioni semplici e condizionate.

$$\Gamma(\alpha, \beta) = \frac{I(\alpha, \beta)}{I(\alpha) I(\beta)} - 1 \qquad (A.14)$$

$$\Gamma(\alpha,p)=\frac{I(a,p)}{I(\alpha)I(p)}-1 \tag{A.15}$$

$$\Gamma(\beta,p)=\frac{I(\beta,p)}{I(\beta)I(p)}-1 \tag{A.16}$$

$$\Gamma(p,\beta/\alpha)=\frac{I(p,\beta/\alpha)}{I(p/\alpha)I(\beta/\alpha)}-1=\frac{\frac{I(\alpha,\beta,p)}{I(\alpha)}}{I(p/\alpha)I(\beta/\alpha)}-1 \tag{A.17}$$

$$\Gamma(\alpha,\beta/p)=\frac{I(\alpha,\beta/p)}{I(\alpha/p)I(\beta/p)}-1=\frac{\frac{I(\alpha,\beta,p)}{I(p)}}{I(\alpha/p)I(\beta/p)} \tag{A.18}$$

$$\Gamma(p,\alpha/\beta)=\frac{I(p,\alpha/\beta)}{I(p/\beta)I(\alpha/\beta)}-1=\frac{\frac{I(\alpha,\beta,p)}{I(\beta)}}{I(p/\beta)I(\alpha/\beta)} \tag{A.19}$$

2) Modello di scomposizione della variazione della prevalenza neonatale della SD

Riportiamo, di seguito, le formule relative agli effetti doppi, tripli e congiunti dei diversi fattori sulla variazione della prevalenza neonatale della SD.

$$I(p,\beta)=\frac{\dfrac{\sum_{15}^{49} {}_2p_i\,{}_2\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49} {}_2p_i\,{}_2\beta_i}}{\dfrac{\sum_{15}^{49} {}_1p_i\,{}_1\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49} {}_1p_i\,{}_1\beta_i}}=\frac{\dfrac{\sum_{15}^{49} \frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i}{\sum_{15}^{49} {}_1D_i}}{\dfrac{\sum_{15}^{49} \frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1N_i}{\sum_{15}^{49} {}_1N_i}} \tag{A.20}$$

$$I(p,\alpha)=\frac{\dfrac{\sum_{15}^{49}{}_2p_i\,{}_1\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49}{}_2p_i\,{}_1\beta_i}}{\dfrac{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i}}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\,{}_1\frac{{}_2p_i}{{}_1p_i}D_i}{\sum_{15}^{49}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}N_i}{\sum_{15}^{49}{}_1N_i}} \tag{A.21}$$

$$I(\alpha,\beta)=\frac{\dfrac{\sum_{15}^{49}{}_1p_i\,{}_2\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49}{}_1p_i\,{}_2\beta_i}}{\dfrac{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i}}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1D_i}{\sum_{15}^{49}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1N_i}{\sum_{15}^{49}{}_1N_i}} \tag{A.21}$$

$$I(\alpha,\beta,p)=\frac{\dfrac{\sum_{15}^{49}{}_2p_i\,{}_2\beta_i k_i\,{}_2\alpha_i}{\sum_{15}^{49}{}_2p_i\,{}_2\beta_i}}{\dfrac{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i k_i\,{}_1\alpha_i}{\sum_{15}^{49}{}_1p_i\,{}_1\beta_i}}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_2p_i}\,{}_1D_i}{\sum_{15}^{49}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_2p_i}\,{}_1N_i}{\sum_{15}^{49}{}_1N_i}} \tag{A.22}$$

$$I(\alpha/\beta)=\frac{I(\alpha,\beta)}{I(\beta)}=\frac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1D_i}{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1D_i} \tag{A.23}$$

$$I(\alpha/p)=\frac{I(\alpha,p)}{I(p)}=\frac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\,{}_1\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i}{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i} \tag{A.24}$$

$$I(\beta/\alpha)=\frac{I(\alpha,\beta)}{I(\alpha)}=\frac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\,{}_1\beta_i}{}_1D_i}{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}{}_1D_i} \tag{A.25}$$

$$I(\beta/p)=\frac{I(\beta,p)}{I(p)}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1N_i}{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}{}_1N_i}} \tag{A.26}$$

$$I(p/\alpha)=\frac{I(\alpha,p)}{I(\alpha)}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}{}_1N_i}{\sum_{15}^{49}{}_1N_i}} \tag{A.27}$$

$$I(p/\beta)=\frac{I(\beta,p)}{I(\beta)}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1N_i}{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}{}_1N_i}} \tag{A.28}$$

$$I(\alpha/\beta,p)=\frac{I(\alpha,\beta,p)}{I(\beta,p)}=\frac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1D_i}{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}{}_1D_i} \tag{A.29}$$

$$I(\beta/\alpha,p)=\frac{I(\alpha,\beta,p)}{I(\alpha,p)}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i}{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1N_i}{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}\,{}_1N_i}} \qquad (A.30)$$

$$I(p/\alpha,\beta)=\frac{I(\alpha,\beta,p)}{I(\alpha,\beta)}=\frac{\dfrac{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\frac{{}_2p_i}{{}_1p_i}\,{}_1D_i}{\sum_{15}^{49}\frac{{}_2\alpha_i}{{}_1\alpha_i}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1D_i}}{\dfrac{\sum_{15}^{49}\frac{{}_2p_i}{{}_1p_i}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1N_i}{\sum_{15}^{49}\frac{{}_2\beta_i}{{}_1\beta_i}\,{}_1N_i}} \qquad (A.31)$$

$$\Gamma(\alpha,\beta)=\frac{I(\alpha,\beta)}{I(\alpha)I(\beta)}-1 \qquad (A.32)$$

$$\Gamma(\alpha,p)=\frac{I(a,p)}{I(\alpha)I(p)}-1 \qquad (A.33)$$

$$\Gamma(\beta,p)=\frac{I(\beta,p)}{I(\beta)I(p)}-1 \qquad (A.34)$$

$$\Gamma(p,\beta/\alpha)=\frac{I(p,\beta/\alpha)}{I(p/\alpha)I(\beta/\alpha)}-1=\frac{\dfrac{I(\alpha,\beta,p)}{I(\alpha)}}{I(p/\alpha)I(\beta/\alpha)}-1 \qquad (A.35)$$

$$\Gamma(\alpha,\beta/p)=\frac{I(\alpha,\beta/p)}{I(\alpha/p)I(\beta/p)}-1=\frac{\dfrac{I(\alpha,\beta,p)}{I(p)}}{I(\alpha/p)I(\beta/p)} \qquad (A.36)$$

$$\Gamma(p,\alpha/\beta)=\frac{I(p,\alpha/\beta)}{I(p/\beta)I(\alpha/\beta)}-1=\frac{\dfrac{I(\alpha,\beta,p)}{I(\beta)}}{I(p/\beta)I(\alpha/\beta)} \qquad (A.37)$$